

B11

In Fig. 15 reference numeral 20 designates an optical element having a plurality of curved, reflective surfaces, which is made of a transparent body such as glass. In the surface of the optical element 20 there are a concave, refractive surface (entrance surface) R2 having a negative refractive power, five reflective surfaces of concave mirror R3, convex mirror R4, concave mirror R5, reflective surface R6, and concave mirror R7, and a convex, refractive surface (exit surface) R8 having a positive refractive power, formed in the order of passage of rays from the object. R1 represents the stop located on the object side of the optical element 20 and R9 the final image plane, on which the image pickup surface of the image pickup device such as CCD is located. All reflective surfaces are surfaces symmetric only with respect to the YZ plane.

IN THE CLAIMS

✓ Please cancel Claims 7, 8, 13, 15 through 19, 23, 25, 26, 28 through 43, and 45 through 68, without prejudice to or disclaimer of the subject matter recited therein.

✓ Please amend Claims 1, 4 through 6, 20, 21, 27, and 44 to read as follows. A marked-up copy of Claims 1, 4 through 6, 20, 21, 27, and 44, showing the changes made thereto, is attached. Note that all the claims currently pending in this application, including those not presently being amended, have been reproduced below for the Examiner's convenience.

B12

1. (Amended) An optical element comprising:
an object-side imaging element for imaging an object on an intermediate image plane in an optical path; and

B12
end

an image-side imaging element for reimaging an object image formed on the intermediate image plane, on a final image plane,

wherein at least one of said object-side imaging element and said image-side imaging element comprises an off-axial curved surface, and

wherein aberration is generated by both of the object-side imaging element and the image-side imaging element, so as to flatten disturbance of a light intensity distribution on the final image plane, caused by a noise source at or near the intermediate image plane.

2. (Unamended) An optical element in which an object image is formed on an intermediate image plane by reflecting a light incident from an object through an entrance plane by at least one reflective surface of a plurality of reflective surfaces and in which a light from the object image is reflected by the remaining reflective surface or surfaces of said plurality of reflective surfaces to be made emergent from an exit plane and to be directed onto a predetermined plane, wherein at least one of an object-side imaging element ranging from the entrance plane to the intermediate image plane and an image-side imaging element ranging from the intermediate image plane to the exit plane comprises an off-axial curved surface and wherein aberration is generated by both of said object-side imaging element and said image-side imaging element, so as to flatten a light intensity distribution produced on the predetermined plane by a noise source at or near the intermediate image plane.

3. (Unamended) An optical element in which an object image is formed on an intermediate image plane by reflecting a light incident from an object through an entrance

surface provided in a surface of a transparent body by at least one reflective surface of a plurality of reflective surfaces provided in the surface of the transparent body and in which a light from the object image is reflected by the remaining reflective surface or surfaces of said plurality of reflective surfaces to be made emergent from an exit surface provided in the surface of the transparent body and to be directed onto a predetermined plane, wherein at least one of an object-side imaging element present from the entrance surface to the intermediate image plane and an image-side imaging element present from the intermediate image plane to the exit surface comprises an off-axial curved surface and wherein aberration is generated by both of said object-side imaging element and said image-side imaging element, so as to flatten a light intensity distribution produced on the predetermined plane by a noise source at or near the intermediate image plane.

613 4. (Amended) An optical element according to Claim 1, wherein said aberration is generated so as to degrade imaging performance of said object-side imaging element and so as to correct the imaging performance thus degraded, by said image-side element.

5. (Amended) An optical element according to Claim 1, wherein said off-axial curved surface is provided in at least one reflective surface out of said plurality of reflective surfaces.

6. (Twice Amended) An optical element according to Claim 1, wherein said optical element has a stop, and wherein the following relation is satisfied:

B13
end

$$V/|\beta_{11}| < U$$

where β_{11} is an image magnification of said image-side imaging element, V a spot size on the final image plane at a fixed aperture diameter of said stop, and U a spot size on said intermediate image plane.

-
9. (Unamended) An optical element according to Claim 4, wherein degradation of the imaging performance of said object-side imaging element is achieved by generating specific aberration independent of a field angle from on the axis to off the axis.
 10. (Unamended) An optical element according to Claim 9, wherein said specific aberration is on-axis astigmatism.
 11. (Unamended) An optical element according to Claim 9, wherein degradation of the imaging performance of said object-side imaging element is achieved by such aberration of torsion that rays in a meridional section jump out of the meridional section, which is generated independent of the field angle from on the axis to off the axis.
 12. (Unamended) An optical element according to Claim 9, wherein a diameter of a spot near said intermediate image plane is two or more times a minimum diameter of said noise source posing a problem even when the system is at a minimum aperture virtue.

14. (Unamended) An optical element according to Claim 9, wherein a diameter of a spot near said intermediate image plane is three or more times a minimum diameter of said noise source posing a problem when the system is at a full aperture.

20. (Twice Amended) An optical apparatus wherein said object is imaged on a photoreceptive surface of an image pickup device by use of the optical element as set forth in Claim 1.

B14
21. (Twice Amended) An optical apparatus comprising at least two optical elements as set forth in Claim 20, wherein relative positions are changed between said at least two optical elements, whereby the object is imaged at different magnifications on an image pickup device.

22. (Unamended) An optical apparatus according to Claim 20, wherein a stop is provided near the entrance surface of said optical element and wherein the following relation is satisfied:

$$10 \cdot b / |\beta_{11}| < SD$$

where SD is a spot diameter on said intermediate image plane, b a length of a minimum resolution given by a size of a pixel of said image pickup device when said stop is at a minimum aperture value, and β_{11} an image magnification of said image-side imaging element.

24. (Unamended) An optical apparatus according to Claim 20, wherein a stop is provided near the entrance surface of said optical element and wherein the following relation is satisfied:

$$15 \cdot b / |\beta_{11}| < SD$$

where SD is a spot diameter on said intermediate image plane, b a length of a minimum resolution given by a size of a pixel of said image pickup device when said stop is at a full aperture value, and β_{11} an image magnification of said image-side imaging element.

BS 27. (Amended) An optical system comprising:
an object-side imaging element for once imaging an object on an intermediate image plane in an optical path; and
an image-side imaging element for reimaging an object image formed on the intermediate image plane, on a final image plane,
wherein at least one of said object-side imaging element and said image-side imaging element comprises an off-axial curved surface, and
wherein aberration is generated by both of the object-side imaging element and the image-side imaging element, so as to flatten a light intensity distribution on the final image plane, caused by a noise source at or near the intermediate image plane. 112.2

B14 44. (Twice Amended) An optical apparatus wherein said object is imaged on a photoreceptive surface of an image pickup device by use of the optical system as set forth in Claim 27.